RATE OF FLOWER ACCEPTANCE BY *ATTA CEPHALOTES*

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Abstract.(JLM) We examined forage selection by *Atta cephalotes* at Corcovado National Park, Costa Rica. Segments of *Aphelandra* sp. flowers were placed on twelve *A. cephalotes* trails (from four colonies) utilizing varying proportions of leaves and *Aphelandra* flowers. We found no association between the rate at which the experimental flower segments were retrieved and the activity rate of ants in the trail, nor the rate at which ants in the trail were already carrying flowers. These results lend support to the hypothesis that forage selection may occur at the individual ant level, and that *Aphelandra* flowers may be a preferred forage item for *A. cephalotes*.

INTRODUCTION (IJS)

Leaf-cutter ants, *Atta cephalotes*, utilize eighty or more species of plants for cultivating fungi used as food (Stevens 1973). Leaf-cutter ants seem to utilize a variety of species and plant parts at any one time. These preferences may not remain constant over time. The mechanism involved in selecting forage plants is not known, although recognition of chemical or physical cues from the plants may be involved.

Stevens (1973) reported that a trail of ants foraging on one resource remains faithful to that resource when given a choice. Bansak et al. (1993) found that ants on trails foraging on *Aphelandra* (Acanthaceae) flowers accepted flower fragments significantly more often and at a faster rate than ants on trails with access to *Aphelandra* but not currently utilizing it. The ants in that study were all from the same colony. These findings support a trail selection hypothesis for forage items in which ants forage only on the 'selected' forage for their trail.

Pilot data indicated that ants may select forage items that are not specific to the trail on which they are travelling. This suggested that individual ants may be able to assess potential forage items, perhaps by physical or chemical means. This would allow the ants to utilize opportunistically those resources that may be a benefit to the colony.

We re-tested the hypothesis (Bansak et al. 1993) that ant trails foraging on *Aphelandra* flowers will accept flower fragments faster than trails not utilizing *Aphelandra*.

METHODS (JMH)

We conducted our study on the Senderos Naranjo and Sirena in Corcovado National Park, Costa Rica on 30 January 1995. We examined 12 trails from four leaf-cutter ant colonies. These trails occurred in both early successional and secondary forest. Some trails were foraging exclusively on leaves, some on flowers and some on a combination of species and flower parts. *Aphelandra* inflorescences with mature flowers were collected from Sendero Naranjo. We cut 1.5 cm segments of the flowers with scissors and handled them with tweezers. For each trial we placed one flower segment in the center of an *A. cephalotes* trail and observed the flower segment for 5 minutes. We repeated this 10 times for each trail. An acceptance of the segment was defined as an ant successfully lifting the flower part and carrying it for ≥ 20 cm on the trail without dropping it. If the flower segment was accepted, we recorded the time it was removed by the ant. If the segment was not accepted after five minutes, we recorded it as a rejection, and removed the piece from the trail.

For each trail, we obtained the number of ants (a measure of trail activity) and the number ants carrying flower segments passing a set location heading towards the colony (a measure of flower utilization for that trail) during 3 minutes. We used these rates to control for differential flower retrieval by trails with different amounts of trail activity.

RESULTS (AVB)

Quantitative

The rate of flower acceptance did not increase with level of trail activity (ants per minute) (Fig. 1), nor with the number of flower parts being moved per minute (Fig. 2). Multiple regression comparing time to flower acceptance to trail activity and to flower utilization along the trail were not significant ($F=0.27$, $df=2, 107$, $P=0.76$).

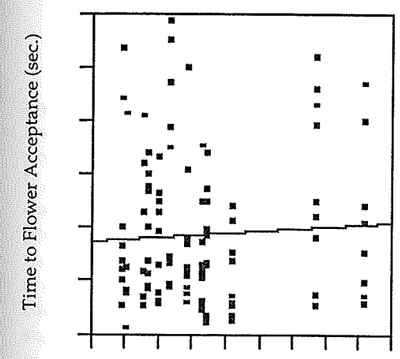

FIG. 1. Flower acceptance time vs. trail activity($r^2=0.0037$, $n=120$).

Observational

We observed behavioral patterns in the ants' response to the introduction of the leaf fragments. When a flower part was placed in the trail, the minima ants were generally the first to attempt to carry it away. Subsequently, because it was usually too large for them to manage, it was lifted by a media ant. Media ants returning to the nest with leaf fragments, however, never dropped their forage to pick up the flower pieces. Only ants coming from the nest, and not carrying a forage item, picked up the flower parts. Soldier ants never attempted to lift or carry the flower segments.

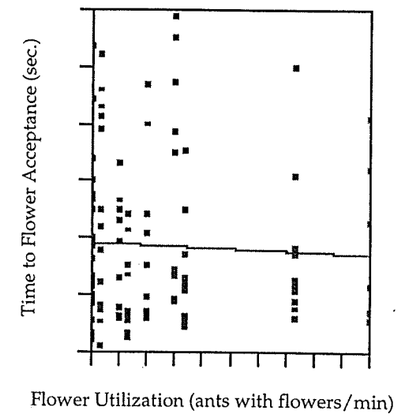

FIG. 2. Time to flower acceptance vs. flower utilization of trail ($r^2=0.0021$, $n=120$).

DISCUSSION (AVB, JLM, WLO)

Contrary to Bansak et al. (1993) who suggested that selection occurs at the trail level, we found that *Aphelandra* flowers were accepted at the same rate by ants of different trails, regardless of the amount of flowers currently being carried along the trail. Therefore, our hypothesis that flower selection may occur at the individual level was supported.

Leaves may be selected at the trail level (Stevens 1973), but the selection for flowers seems to occur at an individual level. While other foreign leaves and plant parts are merely cleared to the side of the trail (Bansak et al, 1993), ants actively accepted flower fragments. These ants may recognize the chemical or physical characteristics of the flower, perhaps through previous exposure to these flowers in the fungal gardens or from past forage selections.

Because flowers were selected in both trails, even those already foraging on leaves, flowers may be a preferred food source. Flowers may have fewer physical and chemical defenses such as cellulose, tannins, lignins, and other toxins than leaves, which would contribute to a faster

decomposition rate and possibly increase the fungal growth rate.

Further studies should investigate whether flowers are in fact a preferred resource over leaves, whether ants prefer certain flowers over others if given a choice, and if there is a difference in decomposition qualities between prefered and non-preferred plant parts.

LITERATURE CITED

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